



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : D06F 67/04	A1	(11) International Publication Number: WO 00/66828 (43) International Publication Date: 9 November 2000 (09.11.00)
<p>(21) International Application Number: PCT/DK00/00222</p> <p>(22) International Filing Date: 3 May 2000 (03.05.00)</p> <p>(30) Priority Data: PA 1999 00600 3 May 1999 (03.05.99) DK</p> <p>(71) Applicant (for all designated States except US): JENSEN DENMARK A/S [DK/DK]; Industrivej 2, DK-3700 Rønne (DK).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): NIELSEN, Steen [DK/DK]; Haslevvej 71, DK-3700 Rønne (DK).</p> <p>(74) Agent: HOFMAN-BANG A/S; Hans Bekkevolds Allé 7, DK-2900 Hellerup (DK).</p>	<p>(81) Designated States: JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published <i>With international search report.</i> <i>In English translation (filed in Danish).</i></p>	
<p>(54) Title: A METHOD AND AN APPARATUS FOR INTRODUCING SUBSTANTIALLY RECTANGULAR PIECES OF LAUNDRY INTO A LAUNDRY TREATMENT APPARATUS</p> <div data-bbox="406 1071 1153 1512"> </div> <p>(57) Abstract</p> <p>An apparatus (1) for unfolding and feeding substantially rectangular pieces of laundry (2) into a cloth treatment apparatus, such as a rotary ironer, using the method according to claim 1, said apparatus comprising a conveyor (11) over which the piece of laundry (2) is positioned unfolded, hanging substantially freely and folded with a first part of the piece of laundry hanging down on the one side of the conveyor and the other part on the other side, and wherein the apparatus further comprises two opposed transport faces (5, 6) in abutment on each other, and wherein the apparatus comprises means for forming a fold on one of the substantially freely suspended portions of the piece of laundry, and means for introducing the fold thus formed on the piece of laundry (2) between the two opposed transport faces (5, 6), said transport faces (5, 6) being in abutment on each other and configured such that the piece of laundry (2) is pulled off by the conveyor (11) with its fold first and subsequently transferred to the subjacent transport face (6).</p>		

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A method and an apparatus for introducing substantially rectangular pieces of laundry into a laundry treatment apparatus

- 5 The invention relates to a method for introducing substantially rectangular pieces of laundry into a laundry treatment apparatus, such as a rotary ironer, and an apparatus for exercising the method.
- 10 Apparatuses of this kind are used primarily in large-scale laundries where they are used to smoothen and unfold large pieces of laundry, such as sheets, tablecloths, eiderdown cases and the like, for subsequent introduction of that piece of laundry into for instance a
- 15 rotary ironer, where it is important that such feeders efficiently unfold and smoothen the pieces of laundry in order to avoid that unintended press folds occur following the rotary ironer. Most frequently the pieces of laundry are introduced into the apparatus in that a piece
- 20 of laundry is fetched from a pile of laundry in its wrinkled state and optionally wet or moist, following which the piece of laundry is introduced into the feeder that subsequently treats the piece of laundry such that it can be transferred to for instance a rotary ironer in unfolded and smoothened state.
- 25

Today numerous suggested configurations of apparatus that are able to carry out said processes are known. Thus for instance US patent No 2,635,370 teaches an apparatus for

30 smoothening and unfolding large pieces of laundry wherein two narrow conveyor belts are configured in abutment on each other between which the piece of laundry can be introduced and suspended to each side of the lowermost conveyor belt and following which eg air jets can be applied

onto the surfaces of the cloth thereby causing the cloth to flutter and be smoothened while suspended in the apparatus. However the apparatus cannot serve as feeder in that the large piece of laundry must subsequently be
5 manually removed from the apparatus and optionally transferred to a rotary ironer. This means that the apparatus cannot in any way whatsoever meet the requirements made to performance efficiency required in today's industrial laundries.

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Published European patent application No 424,290, on the other hand, teaches an actual feeder that comprises ia a short and very wide belt conveyor above which the large piece of laundry is pulled into place from its one side
15 in that approximately the middle of an edge of the piece of laundry is inserted into grippers intended therefor that pull the cloth in place across the belt conveyor. This will typically cause the piece of laundry to be located diagonally across the belt conveyor and therefore
20 means are provided for straightening the piece of laundry whereby two opposed edges of the piece of laundry will be caused to be situated perpendicularly to the advancement direction of the belt conveyor. In this situation the piece of laundry is suspended unfolded and smoothened
25 across the belt conveyer and hereby a bar is provided that can transfer the piece of laundry from the belt conveyor to a subsequent cloth treatment apparatus, if any, such as a rotary ironer. However, this presupposes that the piece of laundry is positioned correctly prior to the transfer, which is accomplished by the belt conveyor advancing the piece of laundry a certain distance. Thus all
30 of the above processes are performed while the piece of laundry hangs across the belt conveyor which means that the subsequent transfer of the piece of laundry must be

relatively accurate in order to ensure that the piece of laundry is transferred in its unfolded state and with the correct orientation.

5 EP patent No 666,360 teaches a method and an apparatus whereby the piece of laundry cannot be straightened and unfolded until it has been introduced into the feeder as such. This is performed in that the piece of laundry is
10 suspended across the conveyor with a relatively large side hanging on the one side of the conveyor and a relatively small side on the other side, and wherein the fold with which the piece of laundry lies across the conveyor is lifted by means of a bar that subsequently presses the piece of laundry in between two opposed transport faces
15 that resiliently abut on each other whereby the piece of laundry is transported on the one transport face in the feeder that has means for correctly orienting and unfolding the pieces of laundry. Hereby a relatively high productivity can be obtained for the introduction of pieces
20 of laundry since the initial straightening and unfolding of the pieces of laundry are avoided and can be performed at a later stage in the feeder.

However, it is a problem in this context that, due to the
25 piece of laundry being suspended with its major part on the one side of the conveyor and the entire piece of laundry being lifted upwards for engagement between the two transport faces, a relatively large height of the machinery is required.

30

Therefore, it is the object of the present invention to provide a method and an apparatus whereby it is possible to obtain a high degree of efficiency in the introduction process, but whereby the height that is necessary

to obtain an effective handling of the pieces of laundry without them touching the support of the apparatus is reduced considerably, *ceteris paribus*.

5 According to the invention this is obtained in that the apparatus comprises means for forming a fold on the substantially freely suspended portions of the piece of laundry and means for introducing the fold thus formed on the piece of laundry (2) between the two opposed transport faces (5,6), said transport faces (5,6) being in mutual abutment and configured such that the piece of laundry (2) is pulled off the conveyor (1) with its fold first and is subsequently conveyed onto the subjacent transport face (6).

15 Since the piece of laundry is hereby transferred with a fold and does not have to be oriented correctly, efficient introduction of pieces of laundry can be accomplished in a subsequent rotary ironer or the like, if any. Simultaneously as a result of the fact that the fold is established on one of the sides of the piece of laundry rather than at the top, at the conveyor, and that the fold is thereby capable of being introduced sideways between the two opposed transport faces, the machine can be
20 constructed with a lower total height, *ceteris paribus*.
25

Since the piece of laundry is conveyed away from the conveyor as soon as it arrives thereon the bar will quickly be ready for renewed feeding of a piece of laundry. This
30 necessitates that the piece of laundry is introduced into the feeder with a longitudinal fold that is subsequently unfolded and that can optionally be straightened somewhere else in the machine.

Claims 2 and 5 feature a further method and apparatus whereby the last unfolding of the cloth is effected in a simple manner.

5 According to a preferred embodiment the conveyor can comprise one or more plate elements (17) with an upper edge that extends along the entire length of the conveyor (11), longitudinally with that of the conveyor belt (16), and means for relative displacement of the upper edge of
10 the conveyor elements to an upper and a lower position, wherein the upper edge extends upwards above and below, respectively, the upper face of the conveyor belt such that the piece of laundry.

15 According to a further preferred embodiment of the invention the opposed transport faces (5,6) each comprises a pair of rollers (7,8) that are located in close proximity to each other at the one side of the conveyor (11), and forms a space between the roller pairs (7,8) for introduction of the fold on the piece of laundry.
20

Besides, the means for forming a fold on one of the substantially freely suspended portions of the piece of laundry and the means for introducing the fold thus
25 formed on the piece of laundry (2) between the two opposed transport faces (5,6) advantageously comprise a number of air nozzles that are located at the one side of the conveyor a distance below the uppermost face of the conveyor, said air nozzles being oriented towards the
30 space between the two transport faces. Thereby a very simple and inexpensive introduction of pieces of laundry between the two transport faces is accomplished.

A convenient embodiment of the invention will be described in detail in the following with reference to the drawing, wherein:

5 Figure 1 shows an apparatus according to the invention seen in a perspective view, and an operator;

Figure 2a is a schematical sectional view of a detail of the apparatus according to Figure 1;

10

Figure 2b shows the detail according to Figure 2a in another process posture;

15 Figure 3 shows the apparatus according to Figure 1 with a piece of laundry that has been transferred into the feeder with a fold; and

Figure 4 shows the apparatus according to Figure 3 wherein the piece of laundry is unfolded.

20

25 Thus, Figure 1 is a schematical and perspective view of an embodiment of a feeder according to the invention. The feeder is provided with two end gables 3 and 4 between which two conveyor belts 5 and 6 are arranged. The conveyor belt 6 extends in part below the conveyor belt 5 that is spanned by the rollers 7 and 9, and the rollers 8 and 10 span the conveyor belt 6.

30 Opposite the rollers 7 and 8 a conveyor 11 is arranged, the functioning of which will be described in the following. As shown, at the one end of the conveyor 11 an operator-operated feeder device is arranged that, in this case, consists of a subjacent transport path 12, above which two parallel conveyor belts 13 and 14 are arranged

such that they are in firm abutment on the transport path 12.

5 Thus the operator starts the process by introducing the piece of laundry 2 between the conveyor belts 13 and 14 and the subjacent transport path 12. The conveyor belts 13 and 14 that pull the piece of laundry 2 upwards to the conveyor 11 are then activated.

10 The functioning and mode of operation of the feeder will then be described as a series of individual operations in accordance with the method of the invention.

15 Thus Figure 2a shows how the piece of laundry 2 is pulled across the conveyor 11 that is arranged opposite the rollers 7 and 8. As opposed to the embodiment shown in Figure 1, it is shown herein how the roller 7 in itself forms a transport face for receiving the piece of laundry. To this end, the conveyor is provided with a conveyor belt 16 that extends throughout the entire length of the conveyor and is thus able too pull the entire piece of laundry 2 in place on the conveyor 11. The piece of laundry will subsequently, as shown in Figure 2a, hang across the conveyor.

25

The conveyor belt 16 on the conveyor 11 is, as shown in Figure 2a, lifted by means of a pneumatic actuator intended therefor, such that the upper transport face on the conveyor belt extends completely above the two gable plates 17. Now, Figure 2b shows how the displaceable conveyor belt 16 will, by means of the pneumatic actuator, be displaced downwards such that the upper edge of the two gable plates 17 extends completely above the transport face on the conveyor belt 16. In this position the

30

air nozzles 19 intended therefor are subsequently activated that will, by means of an air jet 20, blow the piece of laundry 2 in between the two rollers 7 and 8 such that the piece of laundry is caught between the two rollers 7 and 8 whereby a fold is formed on the piece of laundry.

The movement of the conveyor belts 5 and 6 will subsequently cause the piece of laundry 2 with the folded flap 18 to occupy a position in which the piece of laundry 2 is situated as shown in Figure 3 on top of the conveyor belt 6. The piece of laundry 2 thus being removed from the bar 11, the operator can already now insert a new piece of laundry 2 and restart the process again. Final unfolding of the piece of laundry 2 is then effected as shown in Figure 4 in that the piece of laundry 2 is, by the continued movement of the conveyor belt 6 in the direction B shown in Figure 2b, displaced towards that edge on the conveyor belt 6 that is defined by the roller 10 following which the folded flap 18 of the piece of laundry 2 drops over the edge and the piece of laundry is completely straightened and smoothened.

Obviously the embodiment described above and referred to in the drawings can be varied in a vast number of ways. Thus the feeder can alternatively comprise a pair of grippers that hold on to the piece of laundry 2, in principle in the same manner as is the case with the conveyor belts 13 and 14 and the transport path 12. Moreover, these grippers can be configured such that they pull the piece of laundry 2 all the way across the gable plates 17 whereby the conveyor belts 16 of the conveyor become redundant.

As regards the transport faces in this construction, they can also alternatively and optionally consist of roller paths, aircushion paths and the like without departing from the inventive idea of the invention.

5

Besides, it will also be obvious to the person skilled in the art to provide sequence controls and drive means, etc, whereby the feeder 1 is capable of automatically performing the above-described functions.

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It should be noted, however, that the embodiment shown in the drawings distinguishes itself in being of a particularly simple and inexpensive construction, and tests with the feeder 1 have proved that it is possible to obtain an unusually high productivity with a single operator. However, it is possible - if desired - that the same apparatus be operated by several operators in which case each operator has at his disposal a separate feeder.

20

C l a i m s

1. A method of feeding substantially rectangular pieces of laundry (2) into a cloth treatment apparatus, such as
5 a rotary ironer, comprising unfolding of the piece of laundry, wherein the piece of laundry (2) is positioned straightened, hanging folded across a conveyor (11) whereby a first portion of the piece of laundry (2) is caused to hang substantially freely down on the one side
10 of the conveyor, and the other part of the piece of laundry (18) on the other side, and wherein a fold is formed on the piece of laundry, said fold being caused to engage between two opposed transport faces (5,6) that are in abutment on each other and that subsequently pull the
15 piece of laundry (2) off the conveyor with said fold first, **characterised** in that the fold is provided at a distance from the conveyor (1) a distance down on the substantially freely suspended first or second part of the piece of laundry.
- 20 2. A method according to claim 1, wherein the piece of laundry (2) is subsequently transported on the subjacent transport face (6) with the fold in the transport direction towards a finishing edge on the transport face so
25 far that the fold and the folded part of the piece of laundry drop over the finishing edge of the transport face, and the remaining portion is secured on the transport face (6).
- 30 3. A method according to claim 1 or 2, **characterised** in that the positioning of the piece of laundry (2) on the conveyor (11) involves stretching of an edge on the piece of laundry and insertion of the outstretched edge into a gripper device (12,13,14,16) at the one end of the bar

(11), said gripper (12,13,14,16) pulling the piece of laundry across a first end of the conveyor (11), following which the conveyor pulls the piece of laundry (2) longitudinally of the conveyor (11) with the first portion of the piece of laundry hanging down on the one side of the bar, and the other portion on the other side.

4. An apparatus (1) for unfolding and feeding substantially rectangular pieces of laundry (2) into a cloth treatment apparatus, such as a rotary ironer, using the method according to claim 1, said apparatus comprising a conveyor (11) over which the piece of laundry (2) is arranged unfolded, hanging substantially freely and folded with a first portion of the piece of laundry hanging down to the one side of the conveyor and the other portion on the other side, and wherein the apparatus further comprises two opposed transport faces (5,6) that are in abutment on each other, characterised in that the apparatus comprises means for forming a fold on one of the substantially freely suspended portions of the piece of laundry, and means for feeding the fold thus formed on the piece of laundry (2) between the two opposed transport faces (5,6), said transport faces (5,6) being in abutment on each other, and configured such that the piece of laundry (2) is pulled off the conveyor (11) with its fold first and is subsequently transferred to the subjacent transport face (6).

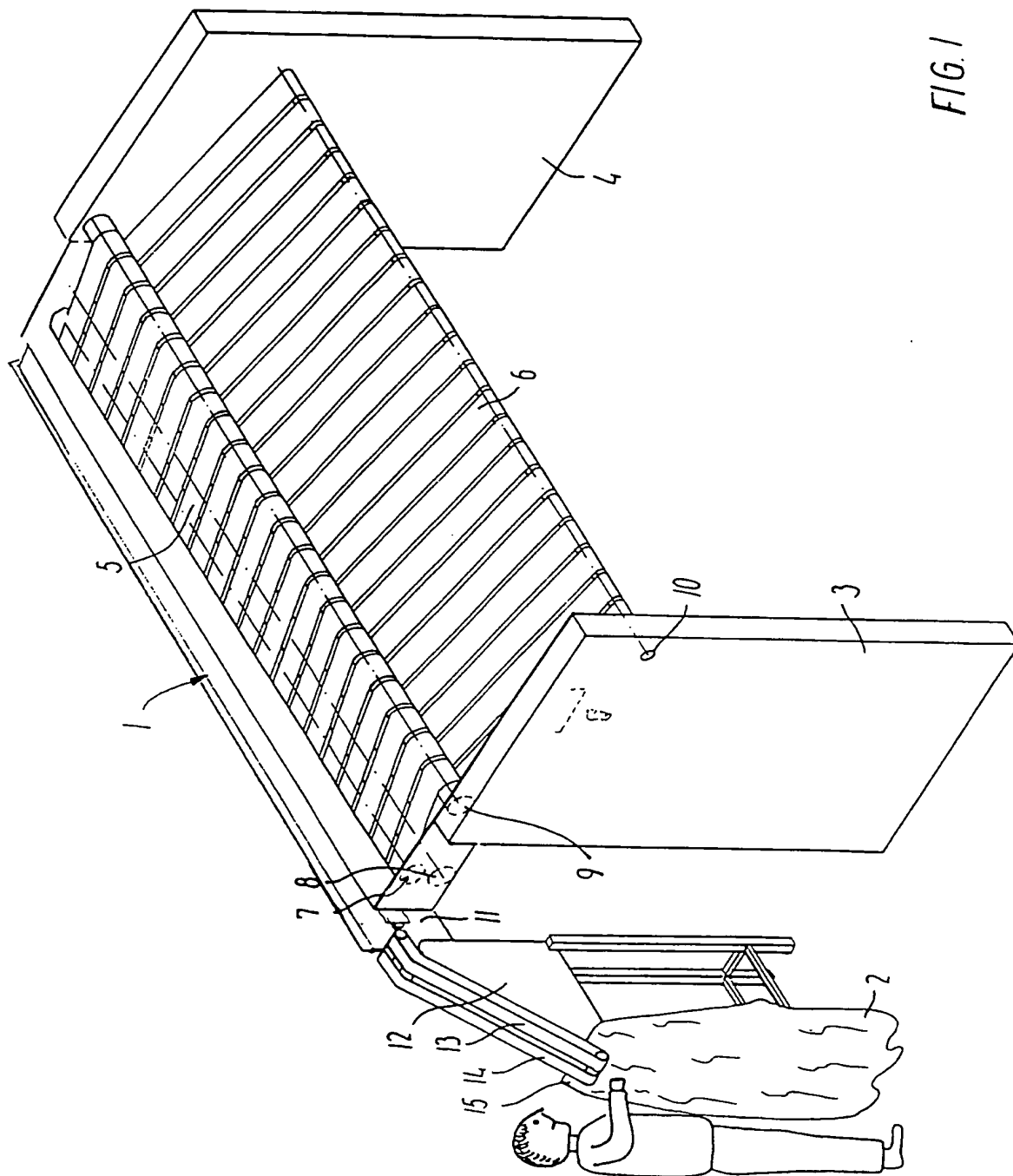
5. An apparatus according to claim 4, characterised in that the subjacent transport face (6) is configured such that the piece of laundry (2) can be transported with the fold first in a direction towards a finishing edge on the transport face so far that the fold and the folded part

(18) of the piece of laundry (2) drops over the finishing edge of the transport face.

- 5 6. An apparatus according to one of claims 4 or 5, **characterised** in that the conveyor (11) comprises a conveyor belt (16) with an upper transport face that extends in the entire length of the conveyor, said transport belt being configured for pulling the piece of laundry from the one end of the conveyor across the conveyor.
- 10 7. An apparatus according to claim 6, **characterised** in that the conveyor further comprises one or more sheet elements (17) with an upper edge that extends along the entire length of the conveyor (11) longitudinally of that of the conveyor belt (16), and means for relative displacement of the upper edge of the sheet elements to an upper and a lower position wherein the upper edge extends above and below, respectively, the upper face of the conveyor belt such that the piece of laundry.
- 15 8. An apparatus according to claim 7, **characterised** in that means are configured for lowering and lifting the conveyor belt (16), respectively.
- 20 9. An apparatus according to one of the preceding claims, **characterised** in that the opposed transport faces (5,6) each extends from a pair of rollers (7,8) that are located in close proximity to each other at the one side of the conveyor (11), and forms a space between the roller pairs (7,8) for introducing the fold on the piece of laundry.
- 25 30 10. An apparatus according to one of the preceding claims, **characterised** in that the means for forming a

fold on one of the substantially freely suspended portions on the piece of laundry and the means for feeding the fold thus formed on the piece of laundry (2) between the two opposed transport faces (5,6) comprise a number
5 of air nozzles that are located at the one side of the conveyor a distance below the upper face of the conveyor, said air nozzles being oriented towards the space between the two transport faces.

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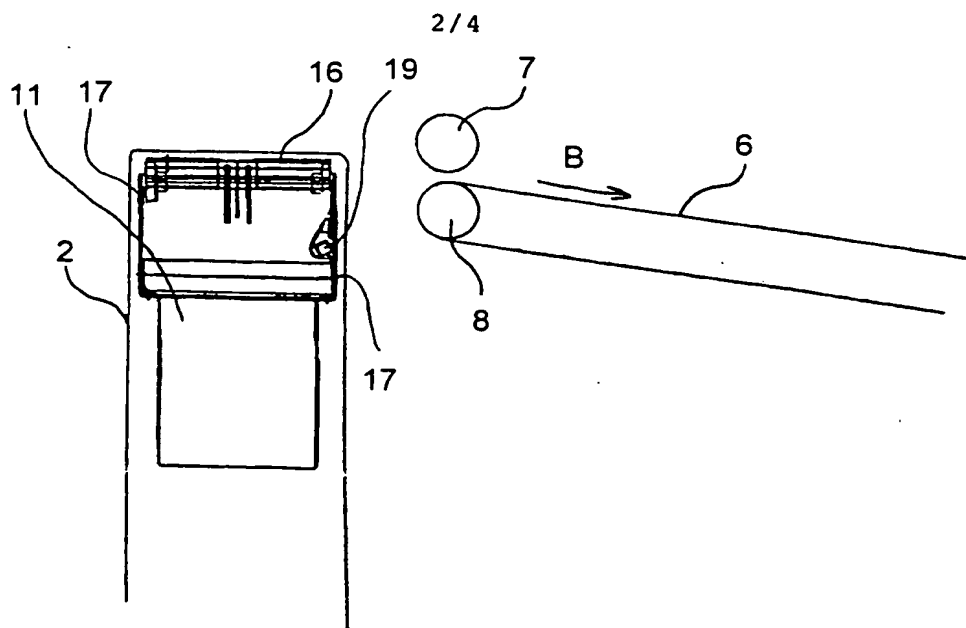


Fig. 2a

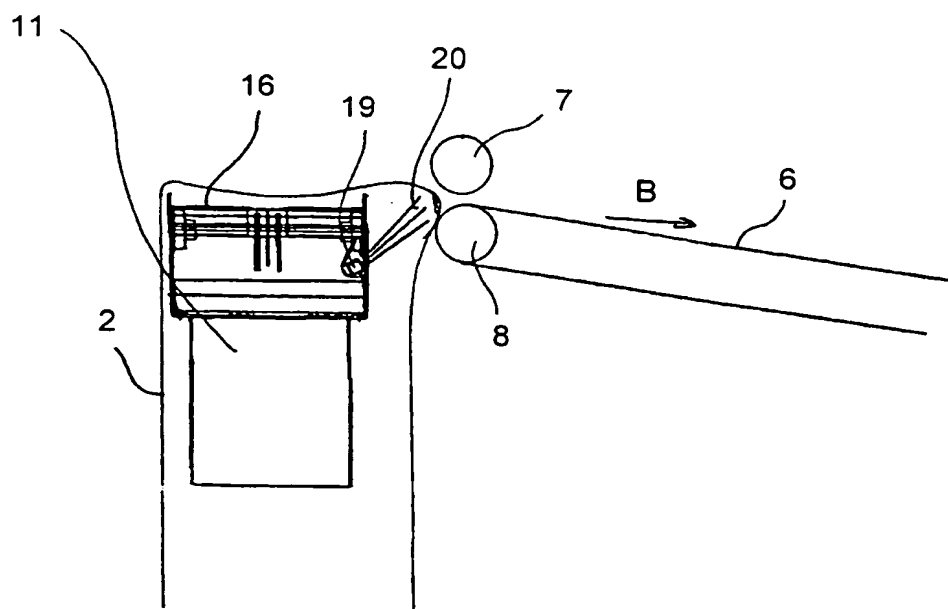
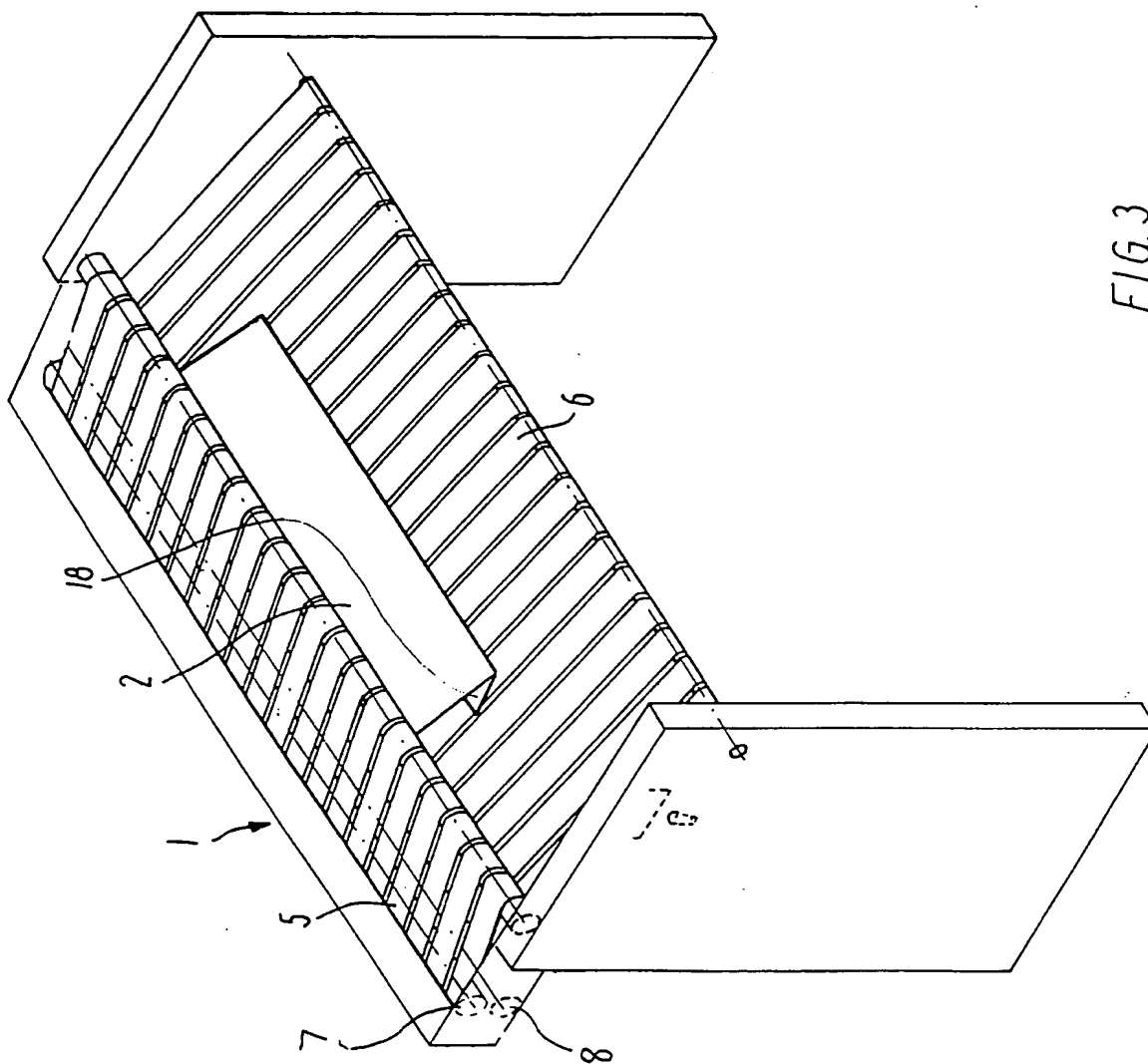


Fig. 2b

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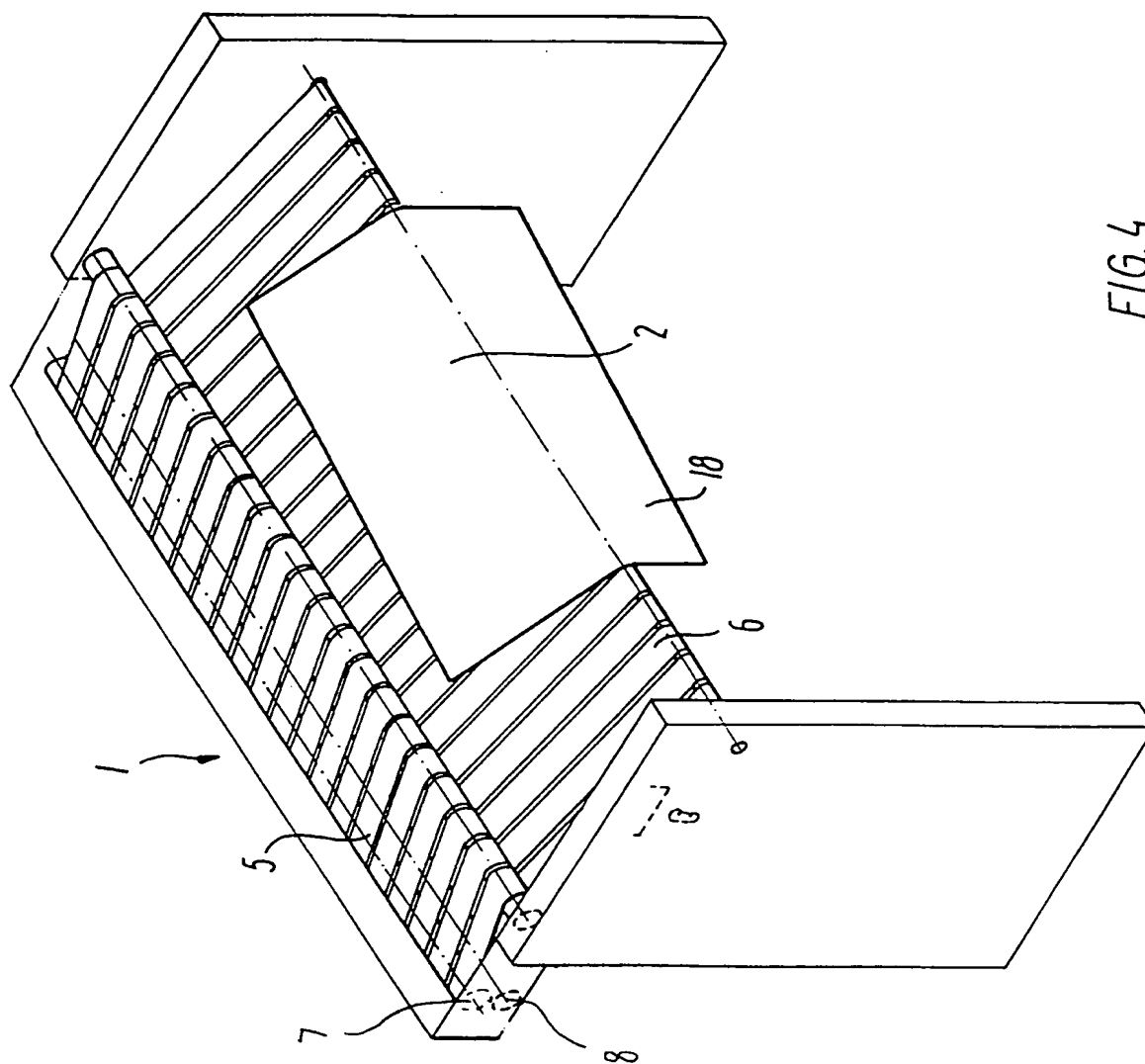


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 00/00222

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: D06F 67/04

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DK 172194 B1 (EJNAR JENSEN & SON A/S), 22 December 1997 (22.12.97)	
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A	EP 0424290 A1 (JEAN MICHEL S.A.), 24 April 1991 (24.04.91)	
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Date of the actual completion of the international search

7 July 2000

Date of mailing of the international search report

26 -07- 2000

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Information on patent family members

02/12/99

International application No.

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Patent document cited in search report			Publication date	Patent family member(s)	Publication date
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